AF/1775
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

K-1951

Applicant : Takuji Goda et al.

Title : GLASS ARTICLE AND GLASS SUBSTRATE FOR DISPLAY PANEL

Serial No. : 09/755,047

Filed : January 8, 2001

Group Art Unit : 1775

Examiner : Andrew T. Piziali

Hon. Director of Patents and Trademarks
Washington, D. C. 20231

March 24, 2003

APPEAL BRIEF

Sir:

Further to the Notice of Appeal of January 30, 2003, the appeal brief has been filed herewith together with the appeal brief fee ($320.00). The appeal brief is submitted in triplicate.

REAL PARTY IN INTEREST

The applicant is the real party in interest.

RELATED APPEALS AND INTERFERENCES

There is no related appeal and interference.

STATUS OF CLAIMS

Claims 8 and 10 are pending in the application. Claims 8 and 10 were rejected finally and are at issue.

STATUS OF AMENDMENT

In response to the final Action, claims 1-7 and 9 were cancelled and claim 8 was amended, to which an advisory Action was issued. In the advisory Action, it was held that the applicant's reply overcame the 35 U.S.C. 112 rejection, and for the purpose of appeal, the

proposed amendment would be entered and claims 8 and 10 were rejected.

SUMMARY OF INVENTION

The present invention relates to a glass substrate for a display panel, such as plasma display panel (PDP), liquid crystal display and so on.

In the glass substrate for a PDP, a soda lime silicate glass substrate or alkali-containing glass plate is generally used. In manufacturing the glass plate, a reduction layer containing Sn^{2+} derived from melted Sn is formed on the glass plate. In manufacturing the PDP using the glass plate, Ag as a bus electrode is applied onto the surface of the glass plate via transparent electrodes, followed by heating at 550-600 °C. In the heating process, Ag^{+} ions are diffused and reach the glass plate through the transparent electrodes, wherein ion exchange between Ag^{+} ions and Na^{+} ions contained in the glass takes place. As a result, Ag^{+} ions migrate into the glass and are reduced by Sn^{2+} in the reduction layer, so that colloids of Ag are formed. Due to the Ag colloids, the glass plate is stained yellow. The similar problem occurs in other metal (pages 2-3 of the specification).

In this respect, a barrier film was formed for preventing metal ions from diffusing into the glass plate. However, the barrier film could not provide sufficient efficiency. Accordingly, the present invention has been made.

As recited in claim 8, a glass substrate for a display of the invention comprises an alkali-containing glass substrate (1); an under layer (5) for preventing diffusion of alkali ions formed on a surface of the alkali-containing glass substrate; a barrier film (2) mainly formed of at least one of indium oxide and tin oxide, and deposited on the under layer; an insulating film (3) deposited on the barrier film and having a surface electrical resistance kept in a range from 1.0×10^{6} Ω/□ to 1.0×10^{16} Ω/□ even after heating process at 550 °C for 1 hour; and an electrode film (4) for forming a display panel deposited on the insulating film. Diffusion of metal ions of the electrode film into the glass substrate is substantially prevented by the barrier film (2) and insulating film (3).

In the invention, if the barrier film (2) is directly deposited onto the glass substrate (1), the barrier film may have a porous structure due to alkaline components of the glass substrate. Therefore, the under layer (5) is formed on the glass substrate (page 4, line 20 to page 6, line 12).

The barrier film (2) formed mainly of indium oxide and/or tin oxide, which is generally used as a transparent electrode, is used to prevent diffusion of metal ions contained in the glass substrate or metal layer formed on the glass (page 6, lines 6-12).

In the invention, the insulating film (3) deposited on the barrier film (2) must have a surface electrical resistance kept in a range from 1.0×10^6 Ω/□ to 1.0×10^{16} Ω/□ even after heating process at 550 ℃ for 1 hour, to prevent leak current and electrification of the substrate (page 10, line 10 to page 11, line 5).

Finally, the electrode film (4) is formed on the insulating film (3). In the invention, the electrode film is deposited on the substrate through the barrier film and the insulating film. Thus, although the glass substrate contains alkali components, metal ions contained in the electrode film do not substantially diffuse into the glass substrate to thereby prevent the stain due to the metal ions. Especially, in the invention, even in the PDP manufacturing process, the diffusion of metal ions can be efficiently prevented.

ISSUE

(1) Whether claim 8 is unpatentable over Tsai et al. in view of Ueoka et al. (paragraph 8 of the final Action)

(2) Whether claim 8 is unpatentable over Tsai et al. in view of Ota. (paragraph 9 of the final Action)

(3) Whether claim 10 is anticipated by Tsai et al. (paragraph 6 in the final Action)

GROUPING OF CLAIMS

Claims 8 and 10 fall together, and claim 8 represents the invention.

ARGUMENT

(1) Whether claim 8 is unpatentable over Tsai et al in view of Ueoka et al.

In Tsai et al., a liquid crystal display device includes first and second transparent conductive electrodes 10a, 10b, and a liquid crystal 17 between the first and second electrodes 10a, 10b. A polarizing plate 11a is deposited above the electrode 10a, while a polarizing plate 11b is deposited under the electrode 10b. Each electrode 10a, 10b has the same structure, e.g. a glass substrate 12a, a TiO_2-SiO_2 composite undercoat 13a under the glass substrate 12a, a transparent conductive ITO layer 14a under the TiO_2-SiO_2 composite undercoat 13a, and a TiO_2-SiO_2 composite overcoat 15a under the conductive ITO layer 14a (Fig. 2).

It is held at column 4, lines 33-37 in Tsai et al. that it may be necessary to form a circuit pattern on each transparent conductive ITO layer 14a and 14b by an etching process before forming the TiO_2-SiO_2 composite overcoat 15a and 15b. The ITO layer 14a is used as a circuit or electrode for the liquid crystal display.

In Tsai et al., it is essential to use the TiO_2-SiO_2 composite layers as the undercoat and overcoat of the transparent conductive ITO layer for providing insulation and hardness, i.e. protection (abstract).

In the invention, the under layer is deposited on the glass substrate, which may be SiO_2, TiO_2 and so on. In Tsai et al., the undercoat 13a is deposited on the glass substrate 12a, and the undercoat 13a is the TiO_2-SiO_2 composite layer. In view of the material used as the undercoat 13a, the undercoat 13a in Tsai et al. corresponds to the under layer of the invention.

In the invention, the barrier film mainly formed of indium oxide and/or tin oxide is formed on the underlayer. In Tsai et al., the ITO layer 14a is deposited on the TiO_2-SiO_2 composite undercoat 13a. Since ITO layer 14a has a circuit pattern (column 4, line 33) used as the electrode in Tsai et al., the ITO layer does not constitute the barrier film of the invention.

In case the ITO layer 14a is considered as the barrier film because the ITO layer 14a contains indium oxide which is used as the barrier film of the invention, it comes to a situation that the LCD

of Tsai et al. does not have an electrode, and can not be operated as intended because the ITO layer 14a is used as the barrier film and there is no electrode in Tsai et al. In this case, Tsai et al. does not operate as the LCD. Thus, it should be recognized that the ITO layer 14a is the electrode in Tsai et al., so that the barrier film of the invention is not formed in Tsai et al.

In case the ITO layer 14a is considered as the electrode operating as the barrier film, since the ITO layer 14a has the circuit pattern, it can not provide a proper barrier film. In the invention, the barrier film operates as it is, not used as the electrode.

In the invention, further, the insulating film having the specific surface electrical resistance is formed on the barrier film, and the electrode film corresponding to the ITO layer 14a in Tsai et al. is deposited on the insulating film, separate from the barrier film. In Tsai et al., the TiO_2-SiO_2 overcoat 15a is formed on the ITO layer 14a, but no electrode is formed on the TiO_2-SiO_2 overcoat 15a. In the invention, the electrode film is deposited on the insulating film, different from that of Tsai et al.

In the invention, in case metal is deposited on the barrier film, diffusion of metal ions of the metal into the glass substrate is substantially prevented by the barrier film. In Tsai et al., the TiO_2-SiO_2 composite layer is used such that the out diffusion of impurities (sodium ions) can be prevented from soda lime glass into liquid crystal to destroy the property of the liquid crystal.

As explained above, the barrier film formed of at least one of indium oxide and tin oxide, and the insulating film of the invention are not disclosed or even suggested in Tsai et al. If the ITO layer in Tsai et al. is considered to be the barrier film of the invention, Tsai et al. does not have the electrode film formed on the insulating film. Therefore, the structure of the invention in claim 8 is not disclosed or suggested in Tsai et al.

In Ueoka et al., the barrier film and the insulating film used in the present invention are not disclosed or suggested. However, as stated in the Action, silver is provided on certain parts of a transparent electrode to form a bus electrode. Namely, parts of the transparent electrode, such as ITO, is formed by silver. In case

parts of the transparent electrode formed in Tsai et al. is made by silver, as stated in the final Action, such a combination does not constitute the invention in claim 8. Therefore, in case Tsai et al. is combined with Ueoka et al., the invention in claim 8 is not formed.

In sum, Tsai et al. has the ITO layer 14a above the TiO_2-SiO_2 composite layer corresponding to the under layer of the invention. However, in Tsai et al., the ITO layer 14a operates as the electrode, not used as the barrier film of the invention. Further, in the invention, the insulating film is deposited on the barrier film, and the electrode film is formed on the insulating film above the barrier film. In this respect, even if the ITO layer is considered as the barrier film, Tsai et al. does not have the electrode deposited on the insulating film of the invention. Tsai et al. does not disclose or even suggest the features of the invention. Even if Ueoka et al. is combined with Tsai et al. the present invention is not obvious.

(2) Whether claim 8 is unpatentable over Tsai et al. in view of Ota.

As explained above, Tsai et al. does not disclose or suggest the structure of claim 8.

In regard to Ota, column 1, lines 12-26 and column 3, lines 1-6 were referred to in the final Action, wherein a low resistive material is layered on a transparent conductive film in a plasma display, and the low resistive material is specified as a bus electrode. In the invention, the electrode film is deposited on the insulating film on the barrier film. However, in Ota, the bus electrode 6 is deposited on the transparent conductive film 2. The electrode film of the invention is entirely different from the bus electrode of Ota. Also, the barrier film and the insulating film used in the present invention are not disclosed or suggested in Ota.

In case Ota disclosing the bus electrode deposited on the transparent conductive film are combined with Tsai et al., the bus electrode in Ota may be deposited directly on the ITO layer 14a of Tsai et al., but such a combination does not constitute the invention. Therefore, even if Ota and Tsai et al. are combined, the present invention in claim 8 is not obvious from the cited references.

(3) Whether claim 10 is anticipated by Tsai et al.

As explained above, claim 8 from which claim 10 depends is not disclosed or suggested by Tsai et al. Therefore, claim 10 depending from claim 8 is not disclosed or suggested by Tsai et al.

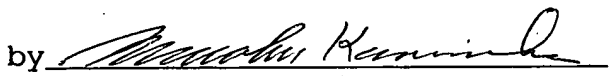
Incidentally, in paragraphs 8 and 9 of the final Action, claim 8 was rejected Tsai et al. in view of Ueoka et al. and Tsai et al. in view of Ota. It is quite strange that claim 10 depending from claim 8 is rejected by only one reference, Tsai et al., though independent claim 8 is rejected by Tsai et al. and an additional reference, Ueoka et al. or Ota.

CONCLUSION

As explained above, the cited references do not disclose or suggest the features of the invention. Even if the cited references are combined, the present application is not obvious from the cited references.

It is respectfully requested to withdraw the rejections and allow the application.

Respectfully submitted,
KANESAKA AND TAKEUCHI

by 
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CLAIMS

8. A glass substrate for a display comprising:

an alkali-containing glass substrate;

an under layer for preventing diffusion of alkali ions formed on a surface of said alkali-containing glass substrate;

a barrier film mainly formed of at least one of indium oxide and tin oxide, and deposited on the under layer;

an insulating film deposited on the barrier film and having a surface electrical resistance kept in a range from 1.0×10^{6} Ω/□ to 1.0×10^{16} Ω/□ even after heating process at 550 °C for 1 hour; and

an electrode film for forming a display panel deposited on the insulating film so that diffusion of metal ions of the electrode film into the glass substrate is substantially prevented by the barrier film and insulating film.

10. A glass substrate as claimed in claim 8, wherein said barrier film consists mainly of said indium oxide or tin oxide.